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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/867,628	05/31/2001	Keiichi Takanashi	2001-0689A	7179

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EXAMINER

SONG, MATTHEW J

ART UNIT	PAPER NUMBER
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1765

6

DATE MAILED: 05/01/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application N .

09/867,628

Examiner

Matthew J Song

Applicant(s)

TAKANASHI ET AL.

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1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) ____ is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-6 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 August 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). ____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____ 6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 3, 4 and 5 are rejected under 35 U.S.C. 103(a) as being obvious over Hofstetter et al (US5,437,242).

Hofstetter et al. teaches an optical recording device (1) positioned outside the apparatus body (Fig 1) directed onto the surface of the melt (2) on which a reflection (4) caused by the rim (6), positioned on the inside of the apparatus (Fig 1), can be observed and functions as a mechanical reference mark. Hofstetter et al also teaches images from the optical recording device are sent to an image-processing device (7), which determines the distance of the rim to the melt surface, i.e. the level of the melt, taking into account the geometrical data of the reference mark and outputs a signal to a control device (8) that determines deviations from the desired distance and generates a control signal for the drive motor (10), which changes the vertical position of the crucible with the aid of the raising and lowering mechanism (13), so that the melt level is controlled to a constant value. (col 5, ln 25-68 and Fig 1) Hofstetter also teaches the image data supplied by the optical recording device also to be used for the determination of the crystal diameter (col 4, ln 7-15)

Hofstetter is silent to the crucible ascent speed is based on a decrease in volume of a melt.

Hofstetter teaches the calculation of the melt level and the raising and the lowering of the crucible so the melt level is controlled to a constant value. It would have been obvious to a person of ordinary skill in the art at the time of the invention that the melt level is directly related to the volume of the melt, i.e. the melt level decreases as the volume of the melt decreases. Also it is inherent to Hofstetter's invention that the level position controlling means to control the level in the crucible by calculating a crucible ascent speed based on a decrease in volume of melt because it would have been obvious to a person of ordinary skill in the art at the time of the invention the melt level decreases as a crystal is pulled from the melt and to maintain the level of the melt during the pulling process, as taught by Hofstetter, the crucible would be raised at a rate equal to the rate of melt being depleted by the growth of the crystal to maintain a constant melt level.

The control device (8) reads on applicant's limitation of crucible ascent speed adjustment value calculating means because it determines deviations in melt level and generates a control signal to the drive motor to change the vertical position of the crucible, as discussed earlier the ascent speed calculation is inherent to Hofstetter's invention. Also the control signal taught by Hofstetter reads on applicant's limitation of adjustment adding means because the drive motor adjusts the height of the crucible to the control signal.

Hofstetter teaches all of the limitations of claim 3, except an averaging means to average level positions measured by the level position measuring means. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Hofstetter's invention to

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average the level positions measured by the level position measuring means because it is known that averaging measurements results in less variation.

Referring to claim 5, it is inherent to Hofstetter's invention to have a automatic updating means to automatically work out a conversion equation for converting a mirror image position of the reference reflector on the melt surface to an actual level position by automatically moving the crucible up and down from the initial position to obtain the relationship between the mirror image position of the reference reflector on the melt surface and the level position and making the relationship approximately a straight line because Hofstetter teaches a similar apparatus with a lifting means and a level controlling means to control the level position of the crucible based on a decrease in volume of the melt.

3. Claims 2 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hofstetter et al. (US 5,437,242) in view of Fuerhoff (5,882,402).

Hofstetter et al teaches all of the limitations of claim 2, except the adjustment value being based on the diameter of a pulling crystal and a crucible rotation speed.

In a method of controlling the growth of a silicon crystal, Fuerhoff teaches a control unit (51) that adjusts the rotation, pull and/or heating parameters to maintain a constant diameter of the crystal as measured by system (11) (col 4, ln 25-30). Fuerhoff also teaches the control unit operates in combination with a two-dimensional camera (53) to determine the growth parameters (col 4, ln 35-39), where the camera provides images of the interior of the crucible to a image processor (69) (col 5, ln 1-5) and the image processor determines an accurate measurement of the diameter of the crystal (col 7, ln 31-43)

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Hofstetter's invention with Fuerhoff's control unit that adjusts growth parameters to maintain a constant diameter because accurate system for measuring crystal diameter during the different phases of crystal growth is needed to ensure crystal quality. (col 1, ln 55-60)

Referring to claim 6, the combination of Hofstetter and Fuerhoff teach all of the limitations of claim 6, except an averaging means to average level positions measure by the level measuring means. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Hofstetter and Fuerhoff's invention to average the level positions measured by the level position measuring means because it known that averaging measurements results in less variation.

4. It is noted that the applicant has used a means plus function limitation in the previous claims. The cited art, Hofstetter and Fuerhoff, perform the functions disclosed by the applicant and are seen as equivalent means because applicant has not disclosed a means in the specification.

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Shimomura et al. (US 5,935,322) teaches optical device (1) and a heat shield plate (3) reflected on the surface of a crystal melt to determine the diameter of the crystal during the pulling process (col 5, ln 35-65)

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Von Ammon et al. (US 5,746,825) teaches the use of a mirror image to determine the diameter of the monocrystal and altering pulling condition to adjust the diameter of the crystal. (col 3, ln 30-45)

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J Song whose telephone number is 703-305-4953.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin L Utech can be reached on 703-308-3868. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

mjs
April 29, 2002


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